

ASSIGNMENT 2

Textbook assignment: Chapter 3, "Special Amplifiers," pages 3-1 through 3-70.

2-1. What is the maximum number of possible inputs in a differential amplifier?

1. One
2. Two
3. Three
4. Four

2-2. What is the maximum number of possible outputs in an differential amplifier?

1. One
2. Two
3. Three
4. Four

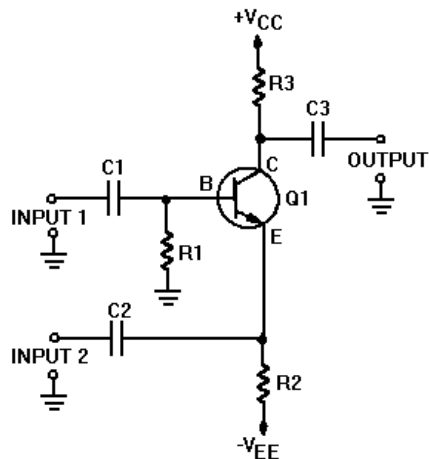


Figure 2A.—Difference amplifier.

IN ANSWERING QUESTIONS 2-3 THROUGH 2-10, REFER TO FIGURE 2A AND THE FOLLOWING INFORMATION: THE AMPLIFIER HAS A GAIN OF 6 AND THE INPUT SIGNALS ARE SINE WAVES WHICH ARE EQUAL IN AMPLITUDE AND VARY BETWEEN +2 VOLTS AND -2 VOLTS.

2-3. If the input signals are in phase with each other, what will the peak-to-peak amplitude of the output signal be?

1. 0 volts
2. 12 volts
3. 24 volts
4. 48 volts

2-4. Which of the following statements describes the output signal if the input signals are in phase with each other?

1. A sine wave in phase with the input signals
2. A sine wave 180 degrees out of phase with the input signals
3. A sine wave 90 degrees out of phase with the input signals
4. Not a sine wave

2-5. If the input signals are 180 degrees out of phase with each other, what will the peak-to-peak amplitude of the output signal be?

1. 0 volts
2. 12 volts
3. 24 volts
4. 48 volts

2-6. Which of the following statements describes the output signal if the input signals are 180 degrees out of phase with each other?

1. A sine wave 90 degrees out of phase with each input signal
2. A sine wave in phase with input signal number one
3. A sine wave in phase with input signal number two
4. Not a sine wave

2-7. If input signal number one is 90 degrees out of phase with input signal number two, what will the peak-to-peak amplitude of the output signal be?

1. 0 volts
2. 12 volts
3. 24 volts
4. 48 volts

2-8. Which of the following statements describes the output signal if input signal number one is 90 degrees out of phase with input signal number two?

1. A sine wave 90 degrees out of phase with input number two
2. A sine wave 180 degrees out of phase with input number one
3. A sine wave 180 degrees out of phase with input number two
4. Not a sine wave

2-9. If input number two is the only input signal applied to the amplifier, what will the peak-to-peak amplitude of the output signal be?

1. 0 volts
2. 12 volts
3. 24 volts
4. 48 volts

2-10. Which of the following statements describes the output signal if input number two is the only input signal applied to the amplifier?

1. A sine wave in phase with the input signal
2. A sine wave 90 degrees out of phase with the input signal
3. A sine wave 180 degrees out of phase with the input signal
4. Not a sine wave

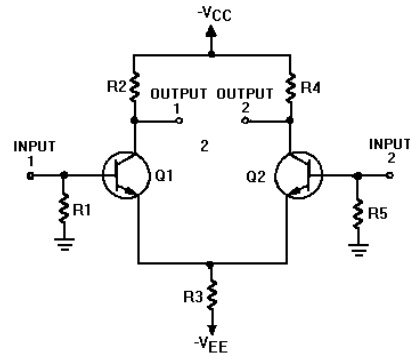


Figure 2B.—Differential amplifier.

IN ANSWERING QUESTIONS 2-11 THROUGH 2-24, REFER TO FIGURE 2B AND THE FOLLOWING INFORMATION: ALL INPUT SIGNALS ARE SINE WAVES WITH A PEAK-TO-PEAK AMPLITUDE OF 5 MILLIVOLTS. THE GAIN OF THE AMPLIFIER IS 100.

2-11. If input number one and output number one are the only terminals used, what will the peak-to-peak amplitude of the output signal be?

1. 1 volt
2. 2 volts
3. 500 millivolts
4. 0 volt

2-12. Which of the following statements describes the output signal if input number one, and output number one are the only terminals used?

1. A sine wave in phase with the input signal
2. A sine wave 90 degrees out of phase with the input signal
3. A sine wave 180 degrees out of phase with the input signal
4. Not a sine wave

- 2-13. If input number one is the only input and both output terminals are used, what will the peak-to-peak amplitude of each output signal be? (Assume base of Q2 grounded)
1. 1 volt
 2. 2 volts
 3. 500 millivolts
 4. 0 volts
- 2-14. If input one is the only input used and an output signal is taken between output number one and output number two, what will the peak-to-peak amplitude of the output signal be? (Assume base of Q2 grounded)
1. 1 volt
 2. 2 volts
 3. 500 millivolts
 4. 0 volts
- 2-15. Which of the following statements describes the output signal if input one is the only input used and an output signal is taken between output number one and output number two?
1. A sine wave twice the amplitude of output number two
 2. A sine wave 90 degrees out of phase with the input signal
 3. A sine wave one-half the amplitude of output number one
 4. Not a sine wave
- 2-16. If the input signals are in phase with each other what will the amplitude of each output signal be?
1. 1 volt
 2. 2 volts
 3. 500 millivolts
 4. 0 volts
- 2-17. If the input signals are in phase with each other and an output signal is taken between the two output terminals, what will the amplitude of the output signal be?
1. 1 volt
 2. 2 volts
 3. 500 millivolts
 4. 0 volts
- 2-18. Which of the following statements describes output signal number one if the input signals are in phase with each other?
1. A sine wave in phase with input signal number one
 2. A sine wave in phase with input signal number two
 3. A sine wave 90 degrees out of phase with input signal number one
 4. Not a sine wave
- 2-19. If the input signals are 180 degrees out of phase with each other, what will the peak-to-peak output of each output signal be?
1. 1 volt
 2. 2 volts
 3. 500 millivolts
 4. 0 volts
- 2-20. If the input signals are 180 degrees out of phase with each other and the output signal is taken between the two output terminals, what will the peak-to-peak amplitude of the output signal be?
1. 1 volt
 2. 2 volts
 3. 500 millivolts
 4. 0 volts

2-21. Which of the following statements describes output signal number one if the input signals are 180 degrees out of phase with each other?

1. A sine wave in phase with input signal number one
2. A sine wave in phase with input signal number two
3. A sine wave in phase with output signal number two
4. Not a sine wave

2-22. Which of the following statements describes the output signal if the input signals are 180 degrees out of phase with each other and the output signal is taken between the output terminals?

1. A sine wave
2. Not a sine wave
3. A sine wave 90 degrees out of phase with input signal number one
4. A sine wave in phase with input signals number one and two

2-23. If the input amplitudes are increased to 15 millivolts and are 180 degrees out of phase, what will be the peak-to-peak amplitude of the combined output?

1. 1 volt
2. 2 volts
3. 3 volts
4. 1.5 volts

2-24. What will be the peak-to-peak amplitude of the combined output if the inputs are 6 millivolts peak-to-peak, 180 degrees out of phase, and the gain is 20?

1. 2 volts
2. 2.4 volts
3. 0.12 volts
4. 0.24 volts

2-25. Which of the following is NOT a requirement for an operational amplifier?

1. Very high gain
2. Very high input impedance
3. Very high output impedance
4. Very low output impedance

2-26. Which of the following types of components are used in most operational amplifiers?

1. Transistor circuits
2. Electron tube circuits
3. Both 1 and 2 above
4. Integrated circuits

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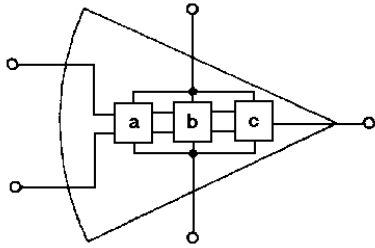


Figure 2C.—Operational Amplifier.

IN ANSWERING QUESTIONS 2-27 THROUGH 2-29, REFER TO FIGURE 2C.

2-27. What is part A of the figure?

1. An input amplifier
2. A power amplifier
3. A voltage amplifier
4. A differential amplifier

2-28. What is part B of the figure?

1. A differential amplifier
2. A voltage amplifier
3. A power amplifier
4. A video amplifier

2-29. What is part C of the figure?

1. An output amplifier
2. A voltage amplifier
3. A differential amplifier
4. A high-impedance amplifier

2-30. If degenerative feedback is used in an operational-amplifier circuit, which of the following terms describes the circuit configuration?

1. Open loop
2. Closed loop
3. Full circle
4. Neutralized

2-31. Which of the following signals determines the stability of the output signal from an operational-amplifier circuit in which degenerative feedback is used?

1. The input signal only
2. The feedback signal only
3. Both 1 and 2 above
4. The detected signal

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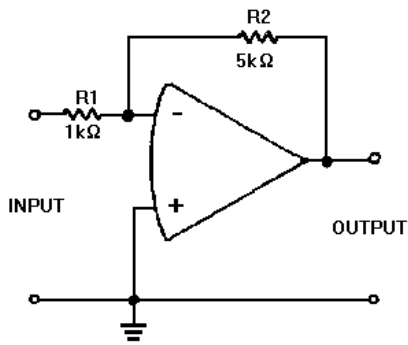


Figure 2D.—Inverting Configuration.

IN ANSWERING QUESTIONS 2-32 THROUGH 2-36, REFER TO FIGURE 2D.

- 2-32. In the inverting configuration of an operational-amplifier circuit where are the (a) input signal and (b) feedback signal applied?

1. (a) Inverting input
(b) Inverting input
2. (a) Inverting input
(b) Noninverting input
3. (a) Noninverting input
(b) Inverting input
4. (a) Noninverting input
(b) Noninverting input

- 2-33. In the inverting configuration of an operational-amplifier circuit with feedback applied and a 1-volt, peak-to-peak, sine wave as an input signal, what is the amplitude of the signal at the inverting input of the operational amplifier?

1. 1 volt
2. 2 volts
3. 10 volts
4. 0 volts

- 2-34. In the inverting configuration of an operational-amplifier circuit, when the noninverting input of the operational amplifier is grounded, what is the term that describes the potential at the inverting input of the operational amplifier?

1. Feedback-signal voltage
2. Input-signal voltage
3. Signal ground
4. Virtual ground

- 2-35. If the amplitude of the input signal to the circuit is +2 millivolts, what will the amplitude of the output signal be?

1. -10 mV
2. -2 mV
3. +10 mv
4. +2 mV

- 2-36. If the unity gain point of the operational amplifier is 1 mega-hertz, what is the bandwidth of the circuit?

1. 100 kHz
2. 200 kHz
3. 300 kHz
4. 400 kHz

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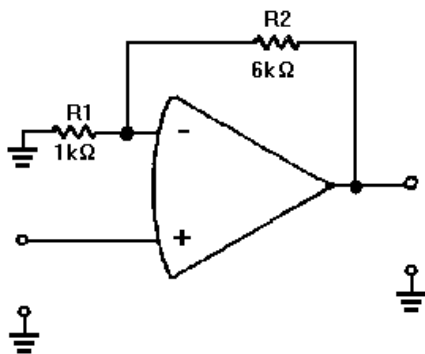


Figure 2E.—Noninverting Configuration.

IN ANSWERING QUESTIONS 2-37 AND 2-38, REFER TO FIGURE 2E.

- 2-37. If the amplitude of the input signal is +10 millivolts, what is the amplitude of the output signal?

1. +70 mV
2. +60 mV
3. -70 mV
4. -60 mV

- 2-38. The open-loop gain of the operational amplifier is 100,000 and the open-loop bandwidth is 10 hertz. If we make it a closed-loop with a gain of 10, what is the bandwidth of the circuit?

1. 100 kHz
2. 350 kHz
3. 500 kHz
4. 583 kHz

- 2-39. Which of the following is a difference between a summing amplifier and an adder circuit?

1. The amount of gain
2. The number of inputs
3. The type of operational amplifier
4. The placement of resistors in the circuit

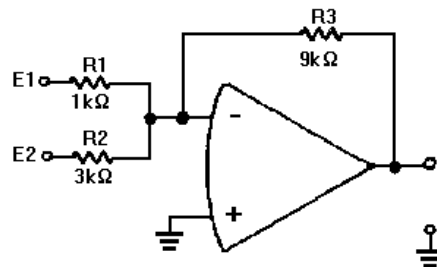


Figure 2F.—Scaling Amplifier.

IN ANSWERING QUESTIONS 2-40 AND 2-41, REFER TO FIGURE 2F.

- 2-40. THIS QUESTION HAS BEEN DELETED.

- 2-41. If the amplitude of the signal at E1 is +3 volts and the amplitude of the signal at E2 is +4 volts, what is the amplitude of the output signal?

1. +39 volts
2. +45 volts
3. -39 volts
4. -45 volts

- 2-42. If the amplitude of the signal at E1 is +5 volts and the amplitude of the signal at E2 is +2 volts, what is the amplitude of the signal at the inverting (−) input of the operational amplifier?

1. 0 volts
2. +7 volts
3. +21 volts
4. +54 volts

- 2-43. Which of the following is a difference between a difference amplifier and a subtractor?

1. The amount of gain
2. The number of inputs
3. The type of operational amplifier
4. The placement of resistors in the circuit

2-44. How many inputs can a (a) difference amplifier and (b) summing amplifier have?

1. (a) Two only
(b) Two only
2. (a) Two only
(b) More than two
3. (a) More than two
(b) Two only
4. (a) More than two
(b) More than two

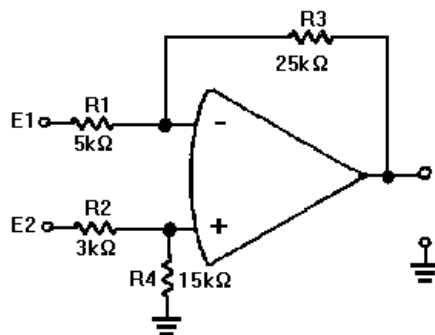


Figure 2G.—Difference Amplifier.

IN ANSWERING QUESTIONS 2-45 THROUGH 2-48, REFER TO FIGURE 2G.

2-45. THIS QUESTION HAS BEEN DELETED.

2-46. If the amplitude of the signal at E1 is +3 volts and the amplitude of the signal at E2 is +9 volts, what will the amplitude of the output signal be?

1. +6 volts
2. +12 volts
3. +30 volts
4. +60 volts

2-47. If the amplitude of the signal at E1 is +6 volts and the amplitude of the signal at E2 is +2 volts, what will the amplitude of the output signal be?

1. +8 volts
2. +20 volts
3. -20 volts
4. -40 volts

2-48. The gain of the operational amplifier shown in figure 2G can be determined by using the ratio of resistance. Which of the following ratios is correct for determining this gain.

1. $\frac{R1}{R2} = \frac{R3}{R4}$
2. $\frac{R1}{R4} = \frac{R2}{R3}$
3. $\frac{R3}{R2} = \frac{R4}{R1}$
4. $\frac{R3}{R1} = \frac{R4}{R2}$

2-49. A magnetic amplifier can be classified as which of the following types of amplifier?

1. RF amplifier
2. Audio amplifier
3. Video amplifier
4. Voltage amplifier

2-50. Which of the following statements describes the basic operating principle of a magnetic amplifier?

1. Any power amplifier will create a magnetic field which can be used to increase the gain of the power amplifier
2. The inductance of an air-core inductor will change as the power used by the load changes
3. A changing inductance can be used to control the current in a load
4. Magnetism can be increased (amplified) by changing the voltage amplitude

2-51. What happens to the true power in a series LR circuit if the inductance is decreased?

1. It increases
2. It decreases
3. It remains the same
4. It increases initially and then decreases rapidly

2-52. If the permeability of the core of a coil decreases, what happens to the (a) inductance and (b) true power in the circuit?

1. (a) Increases (b) increases
2. (a) Increases (b) decreases
3. (a) Decreases (b) increases
4. (a) Decreases (b) decreases

2-53. If the current in an iron-core coil is increased to a large value (from the operating point) what happens to the permeability of the core?

1. It increases
2. It decreases
3. It remains the same
4. It increases initially and then decreases rapidly

2-54. If two coils are wound on a single iron core, a change in current in one coil (a) will or will not cause a change in inductance and (b) will or will not cause a change in current in the other coil.

1. (a) Will (b) will
2. (a) Will (b) will not
3. (a) Will not (b) will
4. (a) Will not (b) will not

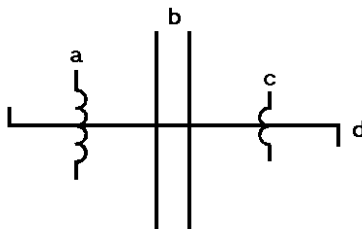


Figure 2H.—Saturable-core reactor.

IN ANSWERING QUESTION 2-55, REFER TO FIGURE 2H.

2-55. What portion of the schematic diagram indicates a saturable core?

1. a
2. b
3. c
4. d

2-56. A magnetic amplifier should be operated on what portion of the magnetization curve?

1. The positive peak
2. The negative peak
3. The mid-point
4. The knee

2-57. A toroidal core is used in a saturable-core reactor to counteract which of the following effects?

1. Hysteresis
2. Copper loss
3. Both 1 and 2 above
4. The effect of load flux on control flux

2-58. Why is a rectifier used in a magnetic amplifier?

1. To decrease current
2. To eliminate hysteresis loss
3. To increase the power-handling capability
4. To convert the magnetic amplifier from an a.c. device to a d.c. device.

2-59. What can be used to set a magnetic amplifier to the proper operating point and leave the control winding free to accept input signals?

1. A filter
2. A bias winding
3. A d.c. power source
4. A feedback network

2-60. A magnetic amplifier would not be used in which of the following devices?

1. A servo system
2. A d.c. power supply
3. Temperature indicators
4. A wideband audio power amplifier system